Best practice is to use new N95s. Decontamination does not solve the PPE shortage crisis, and is an emergency practice to be considered during the COVID-19 pandemic. Efficacy and safety of N95 decontamination has not been fully characterized.

**COVID-19 N95 DECON & REUSE**

**CORONAVIRUS INACTIVATION**

- Hydrogen peroxide inactivates SARS-CoV-2 on all N95 mask types tested\(^1,2\)
- Hydrogen peroxide inactivates viruses and highly-resistant bacterial spores\(^3\)
- Hydrogen peroxide systems differ in dosing and effects

**KEY CONSIDERATIONS**

Hydrogen peroxide is incompatible with cellulose, which is a component of some N95 FFRs
- Data from specific N95 models may not apply to other models
- FDA EUAs require return to original user except for the Battelle process\(^6\)
- Each don/doff can reduce N95 fit; some models lose fit after 5 don/doff cycles, others after >15 cycles\(^6\)
- N95 user seal check should be performed before each reuse

**IMPLEMENTATION**

- VHP, HPV/HPVP, HPGP, iHP, and aHP refer to different hydrogen peroxide methods with varying effects on N95 FFRs
- CDC released guidance on HPV for decontaminating N95 FFRs\(^7\)
- Some hydrogen peroxide systems have received FDA emergency use authorization\(^5\)
- Hospitals have developed SOPs for HPV and VHP\(^8\)
- Hydrogen peroxide processes can be dangerous and require trained personnel

**CONCLUSION**

If implemented properly, and N95 masks are not soiled, it is likely that all of the standard hospital decontamination protocols for HPV/HPVP, VHP, HPGP, iHP and aHP will inactivate SARS-CoV-2 and bacterial spores. Decontamination durations and maximum recommended reuse cycles are extremely different among these methods and misapplication can result in failure to decontaminate and/or failure of N95 mask filtration or fit.

**SUPPORTING RESEARCH**

\[^{1**}\] Kumar et al., 2020; \[^{2**}\] Oral et al., 2020; \[^{3}\] Heckert et al., 1997; \[^{4}\] Battelle, 2016; \[^{5}\] FDA EUA (2020); Battelle, Steris, STERRAD; \[^{6}\] Bergman et al., 2012; \[^{7}\] CDC, 2020; \[^{8**}\] N95decon.org/example-processes

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Best practice is to use new N95 respirators. Decontamination does not solve the PPE shortage crisis, and is an emergency practice to be considered during the COVID-19 pandemic. Efficacy and safety of N95 decontamination has not been fully characterized.

SUPPORTING RESEARCH

v1.0 (May 29, 2020)

**COVID-19 N95 DECON & REUSE**

**LIQUID HYDROGEN PEROXIDE SUBMERSION**

**CORONAVIRUS INACTIVATION**

- Hydrogen peroxide vapor inactivates viruses and other microorganisms on N95 respirators
- Liquid hydrogen peroxide inactivates viruses and highly-resistant bacterial spores on hard surfaces\(^1,2\)
- There are no studies on effectiveness of liquid hydrogen peroxide for inactivating viruses or other microorganisms on N95 respirators.

**N95 MASK INTEGRITY**

- Filtration efficiency was preserved after three, 30-min decontamination cycles in 6% liquid hydrogen peroxide. N95 models tested: 3M 8210, 8000, 1860; Moldex 2200; KC PFR95-270.\(^3,4\)
- No studies have tested N95 fit after submersion in liquid hydrogen peroxide

**KEY CONSIDERATIONS**

Hydrogen peroxide is incompatible with N95 respirators made with cellulose\(^5\)

Data from specific N95 models may not apply to other models

N95 user seal check should be performed before each reuse\(^6\)

Each don/doff can reduce N95 fit; some models lose fit after 5 don/doff cycles, others after >15 cycles\(^7\)

**RISKS**

Insufficient off-gas and drying time may lead to skin irritation from residual hydrogen peroxide

There is a lack of data on the time required to off-gas and dry N95 FFRs after liquid hydrogen peroxide; prior studies have dried masks with a fan for 18 hours\(^4\)

Insufficient duration of submersion may lead to inadequate decontamination

Air bubbles may form between hydrogen peroxide and the N95 and prevent decontamination

**IMPLEMENTATION**

- Liquid hydrogen peroxide at concentrations <8% are rated as non-hazardous (Federal Code of Federal Regulations, Title 29)
- CDC and OSHA guidance list liquid hydrogen peroxide as a possible decontamination method for N95 FFRs\(^6,8\)
- Research is lacking on the virucidal activity of liquid hydrogen peroxide on N95 FFRs, as well as the time required to off-gas and dry

**CONCLUSION**

Liquid hydrogen peroxide is an FDA-approved sterilant for medical equipment and is effective against a wide range of microbes\(^1,2\). While hydrogen peroxide vapor is known to decontaminate N95 FFRs inoculated with SARS-CoV-2, liquid hydrogen peroxide has not been tested for decontamination of N95 FFRs inoculated with virus or spores. Submersion in liquid hydrogen peroxide did not compromise filtration efficiency for tested N95 models, although N95 fit was not tested. Liquid hydrogen peroxide submersion is a promising method, but further testing is required to determine if it inactivates SARS-CoV-2 on inoculated N95 respirators.

**SUPPORTING RESEARCH**

\(^1\) FDA-Cleared Sterilants and High Level Disinfectants with General Claims for Processing Reusable Medical and Dental Devices (4/28/2020);
\(^2\) CDC Disinfection Methods;
\(^3\) Viscusi et al. 2007;
\(^4\) Bergman et al., 2010;
\(^5\) Halliwell, 1965;
\(^6\) CDC, Decontamination & Reuse of FFRs (4/28/2020);
\(^7\) Bergman et al., 2011;
\(^8\) OSHA Enforcement Guidance on Decontamination (4/24/2020)

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